An Enhanced Proposal in Neighbor List Planning for LTE SON Radio Access Networks

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Nowadays, a coexistence of 2nd Generation (2G), 3rd Generation (3G) and 4th Generation (4G) networks is being witnessed. Due to this situation, it became evident the need for Self-Organizing Networks (SON), which aims to automate most of the associated radio planning and optimization tasks. Within SON, this paper presents the latest work around an algorithm that optimizes the Neighbor Cell List (NCL) for Long Term Evolution (LTE) evolved NodeBs (eNBs). The algorithm is based on intra-site distance, its antenna orientation (azimuth/elevation), radiation pattern and overlap areas between cells. The research initial steps were already published (Duarte, D.; Vieira, P.; Rodrigues, A.; Martins, A.; Oliveira, N.; Varela, L., "Neighbour List Optimization for Real LTE Radio Networks," *Wireless and Mobile, 2014 IEEE Asia Pacific Conference on*, pp.183,187, 28-30 Aug. 2014).

The proposed algorithm produces two outputs: a detailed report with the cells which should be added to the new NCL, sorted by priority selection based on its ranking, and a KML file where the created NCL is represented.

In order to compare and validate the proposed methodology, a battery of tests was performed. The existent NCLs produced by radio engineers using visual inspection and network knowledge were compared with the NCLs automatically produced by the algorithm. Coverage gains were calculated using real data from a Portuguese LTE mobile operator.

In Figures 1 and 2, an example of a generated NCL by the algorithm and the associated gain is presented. The associated coverage gains of the algorithm was determined taking into account the initial NCL from the planned cell (old NCL), the new NCL and Reference Signal Received Power (RSRP) measurements extracted after a Drive Test (DT) within the surrounding area.

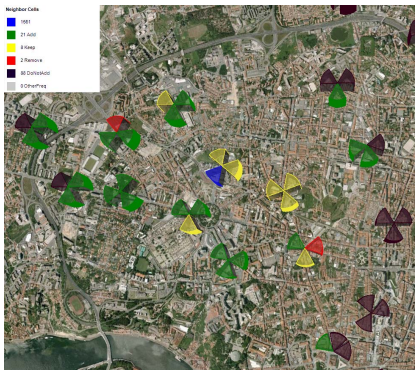

Figure 1 - KML with generated NCL.

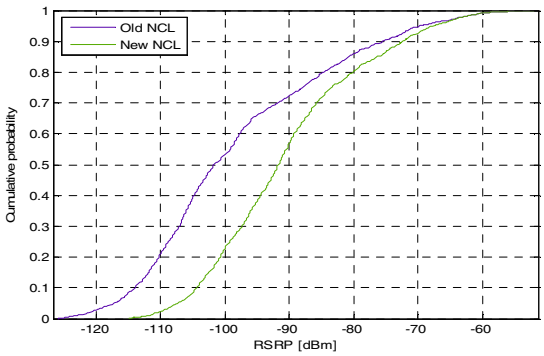

Figure 2 - RSRP CDF comparison.

Figure 1 presents the NCL visual inspection for one cell, colored in blue. The generated NCL considers the already existent cells in the old NCL (in yellow) and the new cells which will be added (in green), all belonging to the first tier of the planned cell. Additionally, the algorithm also suggests to delete cells from the old NCL, which are marked in red. Figure 2 presents the RSRP Cumulative Distribution Function (CDF) when the two NCLs are considered. A median (50% level) 10 dB coverage gain was noticed when using the new NCL generated by the algorithm, which is a rather encouraging result. The full paper version will present more details about the algorithm implementation and validation.